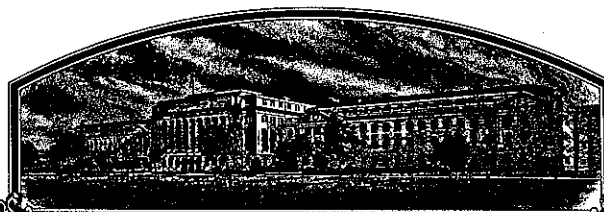


No.

8800120



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME;

Plant Genetics, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE
Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT (T. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

ALFALFA

'Arroyo'



Attest:

Kenneth H. Evans
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D. C. this 29th day of July in the year of our Lord one thousand nine hundred and eighty-eight.

Richard E. Lyng
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

FORM APPROVED: OMB NO. 0581-0055

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) PLANT GENETICS, INC.		2. TEMPORARY DESIGNATION 83B36		3. VARIETY NAME ARROYO	
4. ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code) 1930 5th Street Davis, CA 95616		5. PHONE (Include area code) (916) 753-1400		FOR OFFICIAL USE ONLY PVPO NUMBER 8800120	
6. GENUS AND SPECIES NAME. MEDICAGO SATIVA		7. FAMILY NAME (Botanical) LEGUMINOSEAE		FILING DATE April 7, 1988 TIME 11:00 <input checked="" type="checkbox"/> A.M. <input type="checkbox"/> P.M.	
8. KIND NAME ALFALFA		9. DATE OF DETERMINATION FOUNDATION FALL 85		FEES RECEIVED AMOUNT FOR FILING \$ 1800.00 DATE April 7, 1988 AMOUNT FOR CERTIFICATE \$ 200.00 DATE June 6, 1988	
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) CORPORATION				12. DATE OF INCORPORATION JANUARY 1981	
11. IF INCORPORATED, GIVE STATE OF INCORPORATION CALIFORNIA					

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS

Mr. James C. Weseman
LIMBACH, LIMBACH, & SUTTON
2001 Ferry Building
San Francisco, CA 94111

PHONE (Include area code): (415) 433-4150

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED

- a. ☒ Exhibit A, Origin and Breeding History of the Variety (See Section 52 of the Plant Variety Protection Act.)
b. ☒ Exhibit B, Novelty Statement.
c. ☒ Exhibit C, Objective Description of Variety (Request form from Plant Variety Protection Office.)
d. ☐ Exhibit D, Additional Description of Variety.
e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership.

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act.) ☐ Yes (If "Yes," answer items 16 and 17 below) ☒ No

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?

☐ Yes ☐ No

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?

☐ Foundation ☐ Registered ☐ Certified

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?

☐ Yes (If "Yes," give date)☒ No

19. HAS THE VARIETY BEEN RELEASED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES?

☒ Yes (If "Yes," give names of countries and dates)☐ No

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20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT

SIGNATURE OF APPLICANT

DATE

March 25, 1988

DATE

Exhibit 14 A:

Arroyo is a 52 clone synthetic non-dormant cultivar derived from mass selecting plants for persistence, good agronomic characteristics, and disease-free roots in 3-4 year old fields of the northern San Joaquin Valley, California. The fields were reportedly planted with 581, WL 512, and WL 515 of which 10, 8, and 34 clones were utilized, respectively. In 1983, approximately three cuttings of each clone were transplanted in a screened isolation cage and pollinated with leafcutter and honey bees to produce breeder seed (Syn 1).

Arroyo is uniform and stable through the foundation generation, commensurate with other alfalfa cultivars based on 14 years of performance data. The certified seed generation has revealed no variants from the previous generations.

Exhibit 14 B:

Arroyo is most similar to DK 187 and WL 516, but differs in the following pest resistances:

<u>Characteristics</u>	<u>Arroyo</u>	<u>WL 516</u> ^(a)	<u>DK 187</u> ^(a)
Bacterial Wilt	MR	MR	LR
Fusarium Wilt	HR	HR	HR
Anthracnose	LR	LR	--
Phytophthora Root Rot	HR	HR	R
Spotted Alfalfa Aphid	HR	HR	HR
Pea Aphid	HR	R	HR
Blue Alfalfa Aphid	MR	R	MR
Stem Nematode	HR	MR	--

(a) 1987 Alfalfa Varieties - Published by the Certified Alfalfa Seed Council.

HR = High Resistance

R = Resistance

MR = Moderate Resistance

LR = Low Resistance

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MARYLAND 20705OBJECTIVE DESCRIPTION OF VARIETY
ALFALFA (*Medicago sativa* sensu Gunn et al.)

NAME OF APPLICANT(S) PLANT GENETICS, INC.	TEMPORARY DESIGNATION 83B36	VARIETY NAME ARROYO
ADDRESS (Street and No., or R.F.D. No., City, State, and Zip Code)		FOR OFFICIAL USE ONLY PVPO NUMBER 8800120

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place numbers in the boxes to designate the expressions which are characteristic of the commercial generations of the application variety. Data for quantitative plant characters should be based on a minimum of 100 plants. Include leading zeros when necessary (e.g.,) for quantitative data. Comparative data should be determined from varieties entered in the same trial. Plant color may be precisely designated by using any recognized color chart, e.g., The Munsell Plant Tissue Color Charts.

1. WINTERHARDINESS:

CLASS:

1 = Very Non-Winterhardy (CUF 101)
3 = Intermediately Non-Winterhardy (Mesilla)
5 = (Du Puits)
7 = (Ranger)
9 = Extremely Winterhardy (Norseman)

2 = Non-Winterhardy (Moapa 69)
4 = Semi-Winterhardy (Lahontan)
6 = Moderately Winterhardy (Saranac)
8 = Winterhardy (Vernal)

TEST LOCATION: _____

2. FALL DORMANCY:

FALL DORMANCY (DETERMINED FROM SPACED PLANTINGS)

TESTING INSTITUTION AND LOCATION	DATE OF LAST CUT	DATE REGROWTH SCORED	REGROWTH SCORE OR AVERAGE HEIGHT				LSD .05
			APPLICATION VARIETY	CHECK VARIETIES*			
				CUF101	MOAPA 69		
PLANT GENETICS, INC.							
HANFORD, CA.	11/15/84	12/06/84	9.3	11.8	8.8		2.5
WOODLAND, CA.	11/20/84	02/01/84	4.6	5.5	4.8		0.6

* CUF 101, Moapa 69, Mesilla, Lahontan, Du Puits, Saranac, Ranger, Vernal, or Norseman as appropriate.

REGROWTH MEASURED IN INCHES

Specify scoring system used:

Fall Growth Habit (Determined from Fall Dormancy Trials)

1 = Erect (CUF 101)
7 = Semidecumbent (Vernal)

3 = Semierect (Mesilla)
9 = Decumbent (Norseman)

5 = Intermediate (Saranac)

3. RECOVERY AFTER FIRST SPRING CUT (In Southwest, first cut after March 21):

1 = Very Fast (CUF 101)
9 = Very Slow (Norseman)

3 = Fast (Saranac)

5 = Intermediate (Ranger)

7 = Slow (Vernal)

TEST LOCATION: NO DATA

4. AREAS OF ADAPTATION IN U.S. (Where tested and proven adapted):

Primary Area of Adaptation

Other Areas of Adaptation

1 = North Central

2 = East Central

3 = Southeast

4 = Southwest

5 = Moderately Winterhardy Intermountain

6 = Winterhardy Intermountain

7 = Great Plains

8 = Other (Specify) _____



5. FLOWERING DATE (When 10% of plants possess open flowers at time of first spring cut):

Days Earlier Than

Same As

1 = CUF 101

2 = Mesilla

3 = Saranac

4 = Vernal

5 = Norseman

Days Later Than

NO DATA

TEST LOCATION: _____

6. PLANT COLOR (Determined from healthy regrowth 3 weeks after first spring cut, controlling leafhoppers if necessary):

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☐ 1 = Very Dark Green (524) 2 = Dark Green (Vernal) 3 = Light Green (Ranger)

COLOR CHART VALUE (Specify chart used): NO COMPARISON WITH VARIETIES LISTED ABOVE

APPLICATION VARIETY: _____

VERNAL: _____

TEST LOCATION: _____

7. CROWN TYPE (Determined from spaced plantings):

☒ 3 Noncreeping Types: 1 = Broad (Vernal) 2 = Intermediate (Saranac) 3 = Narrow (CUF 101)

Creeping Types: 4 = Creeping Rooted (Rangelander) 5 = Rhizomatous (Rhizoma)

8. FLOWER COLOR (Determine frequency of plants for each color class as defined by USDA Agricultural Handbook No. 424 (Barnes 1972), allowing all plants in plot to flower):

☐ ☐ ☐ 7 5 % Purple and Violet (Subclasses 1.1 to 1.4) ☐ ☐ ☐ % Blue (Subclasses 2.3 and 2.4)

☐ ☐ ☐ 2 5 % Variegated Other Than Blue (Subclasses 2.1, 2.2, 2.5 to 2.9) ☐ ☐ ☐ % Yellow (Subclasses 4.1 to 4.4)

☐ ☐ ☐ % Cream (Class 3) ☐ ☐ ☐ TRACE % White (Class 5)

TEST LOCATION: FRESNO COUNTY, CA

9. POD SHAPE (Determine frequency of plants with the following pod shapes produced on well cross-pollinated racemes):

☐ ☐ ☐ 1 0 0 % Tightly Coiled (One or more coils, center more or less closed) ☐ ☐ ☐ % Loosely Coiled (One or more coils, center conspicuously open)

☐ ☐ ☐ % Sickle (Less than 1 coil)

TEST LOCATION: FRESNO COUNTY, CA

10. PEST RESISTANCE: Provide in the appropriate column, trial data for application variety, and resistant (R) and susceptible (S) check varieties, synthetic generation tested, average severity index scores (ASI), least significant difference statistics (LSD .05), the institution in charge of test, year, and location of test, and whether test is a field or laboratory evaluation. Describe scoring system, and any test procedure which differs from standard methods proposed by Elgin (1982). Trial data from other test years or locations should be presented whenever available on a separate document as Exhibit D.

Seeds of the check varieties and germplasm lines listed below can be obtained from the USDA Field Crops Laboratory, Bldg. 001, Rm. 335, BARC-West, Beltsville, MD 20705. Although comparisons with check varieties listed below are preferred, comparisons with any appropriate check variety recommended by Elgin (1982) may be presented.

A. DISEASE RESISTANCE: DISEASE		VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	% resist ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Anthraxnose, Race 1 (<i>Colletotrichum trifolii</i>)	Application	2	10.2	199	NA	9.4	PLANT GENETICS, INC. 1986 WOODLAND, CA. GREENHOUSE	
	Arc (S) SARANAC AR(R)	52.4	1096					
	Saranac (S)	1.0	932					
	SCORING SYSTEM: % SEEDLING SURVIVAL							
Anthraxnose, Race 2 (<i>Collectotrichum trifolii</i>) NO DATA	Application							
	Saranac AR (R)							
	Arc (S)							
	SCORING SYSTEM:							
Bacterial Wilt (<i>Corynebacterium insidiosum</i>)	Application	1	20.4	ASSUMED 150-225	2.87	0.38	UNIVERSITY OF MINNESOTA 1986 ROSEMOUNT, MN FIELD	
	Vernal (R)	42.0	ASSUMED 150-225	2.35				
	Narragansett (S)	5.4	ASSUMED 150-225	3.58				
	SCORING SYSTEM: 0-5; %0's + 1's = % resistance							
Common Leafspot (<i>Pseudopeziza medicaginis</i>) NO DATA	Application							
	MSA-CW3AN3 (R)							
	Ranger (S)							
	SCORING SYSTEM:							

NO DATA

DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	% resist. ASD LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Downy Mildew (<i>Peronospora trifoliorum</i>)	Application						
Isolate, if known:	Saranac (R)						
NO DATA	Kanza (S)						
SCORING SYSTEM:							
Fusarium Wilt (<i>Fusarium oxysporum</i> f. <i>medicaginis</i>)	Application	1	70.9	ASSUMED 120-180	1.55	0.53	UNIVERSITY OF MINNESOTA
	Moapa 69 (R)		75.9	ASSUMED 120-180	1.43		1986
	Nacagansett (R) MNGN - 1(S)		5.0	ASSUMED 120-180	4.72		ROSEMOUNT, MN
SCORING SYSTEM: 0-5; % 0's + 1's = % resistance							
Phytophthora Root Rot (<i>Phytophthora megasperma</i> f. <i>medicaginis</i>)	Application	1	58.1	ASSUMED 300-450	3.22		UNIVERSITY OF MINNESOTA
	Agate (R)		42.0	ASSUMED 300-450	3.53		1986
	Saranac (S)		2.9	300-450	4.92		ST. PAUL, MN
SCORING SYSTEM: 1-6; % 1's + 2's = % resistance							
Verticillium Wilt (<i>Verticillium albo-atrum</i>)	Application						
NO DATA	Vertus (R)						
	Saranac (S)						
SCORING SYSTEM:							
Other (Specify)	Application						
	(R)						
	(S)						
SCORING SYSTEM:							
Other (Specify)	Application						
	(R)						
	(S)						
SCORING SYSTEM:							

B. INSECT RESISTANCE:

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT DEFOLIATION	DEFOLIATION IN PERCENT OF RESISTANT CHECK	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Alfalfa Weevil (<i>Hypera postica</i>)	Application						
NO DATA	Arc (R)			100			
	Saranac (S)						
SCORING SYSTEM:							

10. C. NEMATODE RESISTANCE (Continued):

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NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	% resist. ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Southern Root Knot (<i>Meloidogyne incognita</i>) NO DATA	Application						
	Moapa 69 (R)						
	Lahontan (S)						
	SCORING SYSTEM:						
Stem Nematode (<i>Ditylenchus dipsaci</i>)	Application	2	62.5	100	2.62	0.27	PLANT GENETICS, INC 1986 WOODLAND, CA. GREENHOUSE
	Lahontan (R)		55.0	105	2.78		
	Ranger (S)		4.2	273	3.86		
	SCORING SYSTEM: 1-5; % 1's + 2's = % resistance						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						

11. INDICATE THE VARIETY THAT MOST CLOSELY RESEMBLES THE APPLICATION VARIETY FOR EACH OF THE FOLLOWING CHARACTERS:

CHARACTER	VARIETY	CHARACTER	VARIETY
Winterhardiness	MOAPA 69	Plant Color	NO CRITICAL DATA
Recovery After 1st Cut	MOAPA 69	Crown Type	MOAPA 69
Area of Adaptation	MOAPA 69	Combined Disease Resistance	WL516
Flowering Date	MOAPA 69	Combined Insect Resistance	DK187

REFERENCES

Barnes, D.K. 1972. A System for Visually Classifying Alfalfa Flower Color. U.S. Dep. Agric. Handb. 424. 18 pp. (Note: Greenish cast of plate 6, A and B is an artifact of printing, actual colors a blend of yellow and white.)

Elgin, J.H., Jr., (ed.). 1982. Standard Tests to Characterize Pest Resistance in Alfalfa Cultivars. U.S. Dep. Agric. Tech. Bull. (In Press).

Gunn, C.R., W.H. Skrdla, and H.C. Spencer. 1978. Classification of *Medicago sativa* L. using legume characters and flower colors. U.S. Dep. Agric. Tech. Bull. 1574. 84 pp.

Munsell Color Co. 1977. Munsell Plant Tissue Color Charts. Munsell Color Co., Inc. Baltimore.

NOTE: Any additional descriptive information and supporting documentation may be provided as Exhibit D.

10. B. INSECT RESISTANCE (Continued):

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT SEEDLING SURVIVAL	NUMBER OF SEEDLINGS TESTED	ASI	% resist. ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Blue Alfalfa Aphid (<i>Acyrtosiphon kondoi</i>)	Application	1	17.0	167	NA	7.7	PLANT GENETICS, INC. 1985 WOODLAND, CA. GREENHOUSE
	CUF 101 (R)		50.0	170			
	PA-1 (S) CALIVERDE(S)		0.1	188			
	SCORING SYSTEM: % SEEDLING SURVIVAL						
Pea Aphid (<i>Acyrtosiphon pisum</i>)	Application	1	79.1	137	NA	13.3	PLANT GENETICS, INC. 1984 WOODLAND, CA. GREENHOUSE
	Kanza (R) CUF101 (R)		59.8	119			
	Ranger (S) MOAPA 69 (S)		3.3	124			
	SCORING SYSTEM: % SEEDLING SURVIVAL						
Spotted Alfalfa Aphid (<i>Therioaphis maculata</i>) Biotype, if known:	Application	1	86.6	216	NA	11.4	PLANT GENETICS, INC. 1984 WOODLAND, CA GREENHOUSE
	Kanza (R) CUF 101 (R)		80.0	200			
	Ranger (S) CALIVERDE (S)		0.0	1340			
	SCORING SYSTEM:						

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Potato Leafhopper Yellowing (<i>Empoasca fabae</i>)	Application						
NO DATA	MSA-CW3An3 (R)						
	Ranger (S)						
	SCORING SYSTEM:						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						

C. NEMATODE RESISTANCE:							
NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Northern Root Knot (<i>Meloidogyne hapla</i>) NO DATA	Application						
	Nev. Syn. XX (R)						
	Lahontan (S)						
	SCORING SYSTEM:						

Exhibit 14 E:

The principal breeder, Ike Kawaguchi, was employed by PLANT GENETICS, INC. All rights to alfalfa varieties developed by the breeder while employed by PLANT GENETICS, INC. are assigned to PLANT GENETICS, INC.